Towards a trophectoderm stem-cell model representing human blastocysts of the highest implantation potential

Grant Award Details

Towards a trophectoderm stem-cell model representing human blastocysts of the highest implantation potential

Grant Type:	Foundation - Discovery Stage Research Projects
Grant Number:	DISC0-13816
Project Objective:	To establish a single cell gene expression atlas of human blastocysts with high potential (morphology-based) for implantation and to evaluate existing trophoblast stem cell models to identify conditions for an in vitro model of implantation-competent polar trophectoderm.

Investigator:

Name:	Heidi Cook-Andersen
Institution:	University of California, San Diego
Type:	PI

Disease Focus:	Fertility
Human Stem Cell Use:	Embryonic Stem Cell, Other
Award Value:	$1,584,000
Status:	Active

Grant Application Details

Application Title:	Towards a trophectoderm stem-cell model representing human blastocysts of the highest implantation potential

Public Abstract:

Research Objective

To define a new reference for embryos and stem cell lines of the highest developmental potential and work towards a trophoblast stem cell model to study factors important for successful implantation

Impact

The molecular determinants of successful human blastocyst implantation remain unknown and trophectoderm stem cell models to study these embryo factors and improve implantation success are needed

Major Proposed Activities

- To determine the pattern of gene expression expected in cells of each lineage—and the cell-cell signals between them--for blastocysts with the highest developmental potential
- To identify the specific genes and cell-cell signals—among the thousands present--that are uniquely enriched in blastocysts of high compared low development potential
- To identify candidate ligand-receptor signals between polar trophectoderm of the blastocyst and maternal endometrium important for successful implantation
- To evaluate the developmental state and potential of current trophoblast stem cell models relative to blastocysts of high developmental potential
- To determine the degree to which network of cell-cell signals predicted for trophoblast stem cell models with models for the EPI and PrE and for maternal endometrium resemble signals expected in vivo
- To test whether signals from cells representing neighboring blastocyst lineages enhance expression of biomarkers of polar trophectoderm with high implantation potential

Statement of Benefit to California:

Failed embryo implantation represents one of the greatest obstacles in infertility. However, the molecular mechanisms required for successful implantation of the human embryo are poorly understood. We take a novel approach to identify factors most highly associated with successful implantation in human embryos and steps to develop an in vitro stem cell model to learn to optimize expression of these factors. We hope our findings will lead to increases in embryo quality and implantation success.